

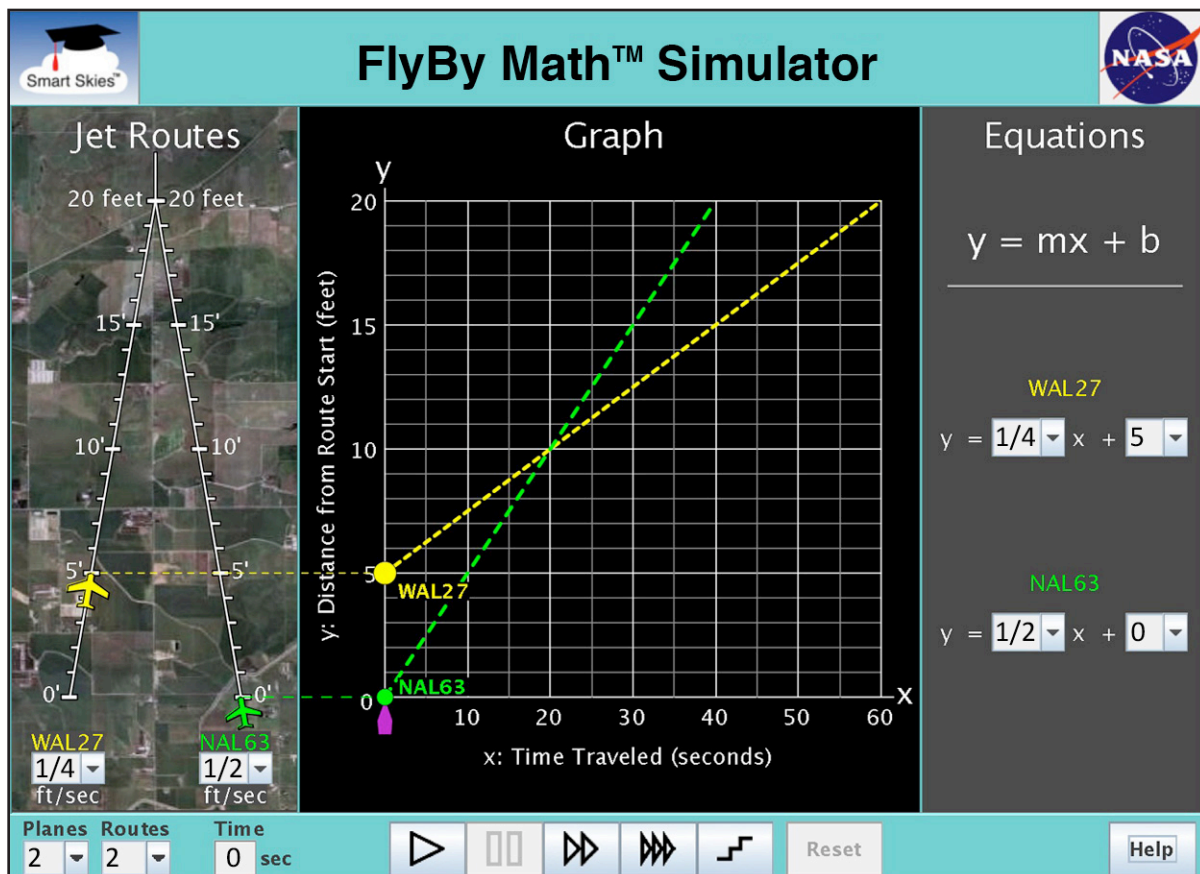


Student Worksheet A

Introduction to the FlyBy Math Simulator

In this worksheet, you will become familiar with the three simulator panels.

Jet Route Panel	Graph Panel	Equation Panel
<ul style="list-style-type: none"> The planes fly at the same altitude. Each jet route is 20 feet long. The jet routes meet at the 20-foot mark. 	<ul style="list-style-type: none"> For each plane, its distance vs. time graph is shown. That graph is a straight line. 	<ul style="list-style-type: none"> An equation is given for each line on the graph. Each equation is written in slope-intercept form: $y = mx + b$



You will learn:

- How to set a plane's speed and starting position.
- How to run and reset a simulation.

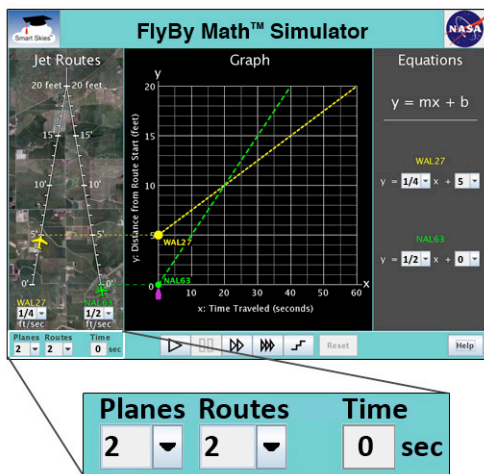
Exploring the Simulator

Tip:

If the clock time (below the Jet Route Panel) is not 0 seconds, then you will need to click Reset to change:

- The number of planes
- A plane's speed
- A plane's starting position on its jet route

Problem 1: Set up the simulator using the Jet Route Panel



(a) Select the number of planes and jet routes

Select: 2 planes, 1 route

Which planes do you see?

WAL27

NAL63

With 2 planes, can you select 2 routes?

Yes

No

Select: 1 plane, 1 route

Which plane do you see?

WAL27

NAL63

With 1 plane, can you select 2 routes?

Yes

No

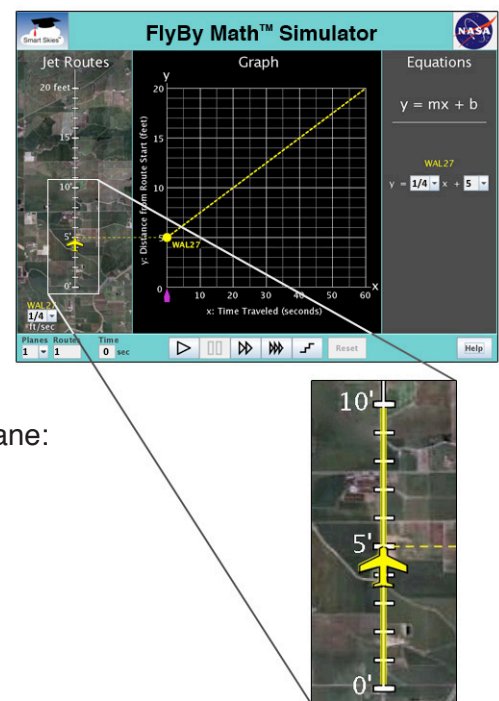
(b) Select a plane's starting position

Select: 1 plane, 1 route (Click Reset if necessary.)

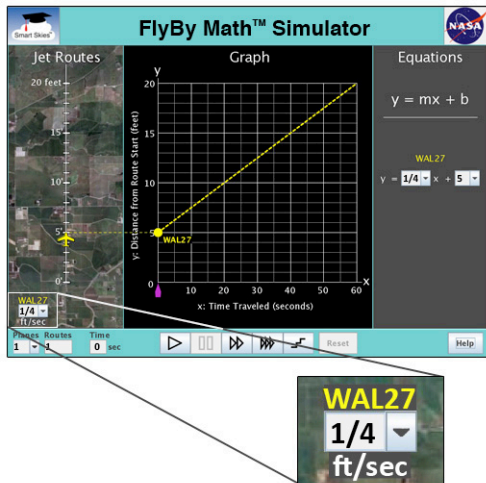
Drag the WAL27 plane forward and backward, from 0 ft to 10 ft, along the jet route.

Check all the items that change when you drag the WAL27 plane:

- ☒ The position of the WAL27 dot on the y-axis of the graph.
- ☐ The slope (steepness) of the WAL27 line on the graph.
- ☐ The value of m in the WAL27 equation.
- ☒ The value of b in the WAL27 equation.



Problem 1 continued...



(c) Select a plane's starting speed

Select: 1 plane, 1 route (Click Reset if necessary.)

Use the WAL27 speed menu to change the plane's speed.

Check all the items that change when you change the WAL27 speed:

- ☐ The position of the WAL27 dot on the y-axis of the graph.
- ☒ The slope (steepness) of the WAL27 line on the graph.
- ☒ The value of m in the WAL27 equation.
- ☐ The value of b in the WAL27 equation.

Problem 2: Run the simulation

Set up the simulator:

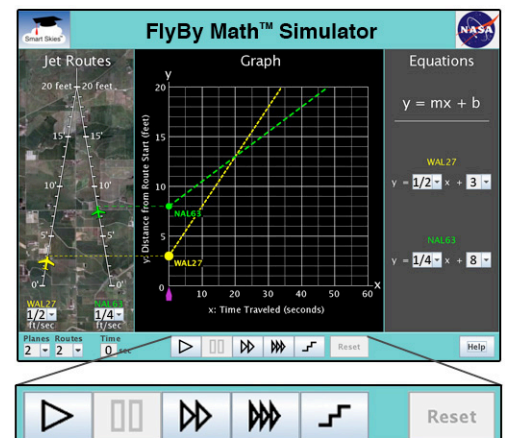
- If the clock time is not 0 seconds, click Reset.
- Choose 2 planes and 2 routes.
- WAL27 starting position: 3 ft from the start of its jet route
- NAL63 starting position: 8 ft from the start of its jet route
- WAL27 starting speed: $1/2$ ft/sec
- NAL63 starting speed: $1/4$ ft/sec

(a) Run the simulation

Click Play.

Check all the statements that describe what happens when you click Play:

- ☒ Each plane moves on its jet route.
- ☒ The clock runs.
- ☒ Each dot moves on the graph.
- ☒ The time slider moves along the x-axis.
- ☐ In each equation, the value of m changes.
- ☐ In each equation, the value of b changes.

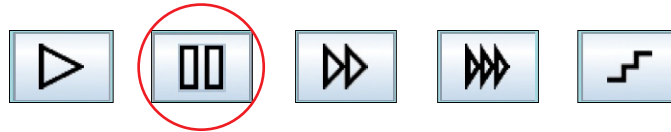


Problem 2 continued...

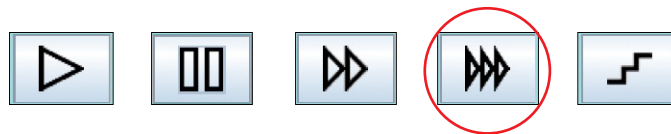
(b) Explore the Control Panel

In the Control Panel, mouse over each button to learn its action.

Circle the Control Panel button you would use to **pause** the simulation.



Circle the Control Panel button you would use to make the simulation **run as fast as possible**.



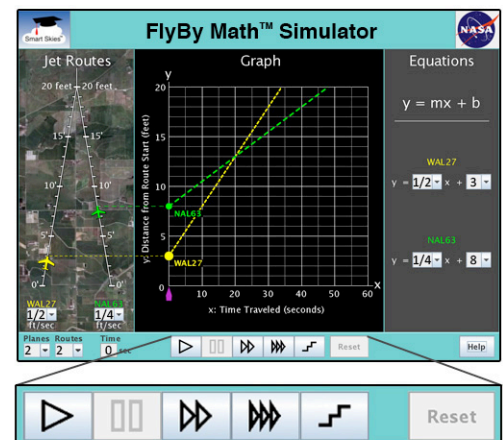
(c) Use the Step button

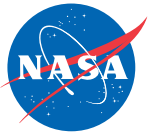
If the clock time is not 0 seconds, click Reset.

Click Step.  Click it again and again.

Check all the statements that describe what happens when you click Step.

- ☒ In the Jet Route Panel, each plane moves ahead on its route.
- ☒ The clock advances to the next second.
- ☒ In the Graph Panel, each dot moves up and to the right along its line.
- ☒ In the Graph Panel, the time slider advances to the next whole second.
- ☐ In the Equation Panel, for each equation, the value of m changes.
- ☐ In the Equation Panel, for each equation, the value of b changes.





Problem 3: Reset the simulation

(a) Reset the simulation using the Reset button

Set up the simulator:

Make sure the clock time is **not** 0 seconds.

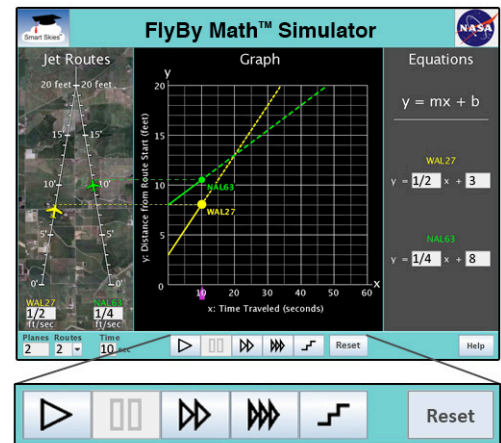
(If the clock time is 0 seconds, click Play to run the simulation for at least 10 seconds. Then click Pause.)

Click *Reset*.

Reset

Check all the actions that happen when you click Reset.

- ☒ The time slider returns to 0 seconds on the x-axis.
- ☒ The clock reads 0 seconds.
- ☒ Each dot on the graph returns to the y-axis.
- ☒ Each plane returns to its starting position on its jet route.
- ☐ In each equation, the value of m changes.
- ☐ In each equation, the value of b changes.

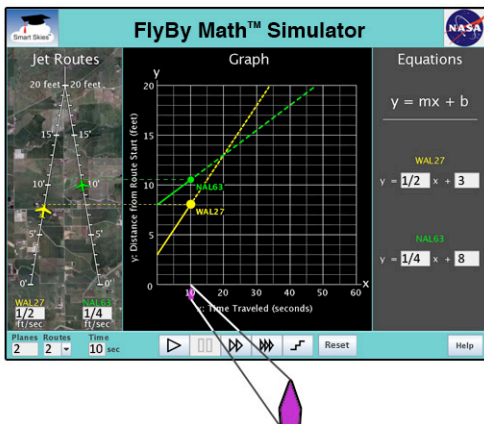


(b) Reset the simulation using the time slider

Set up the simulator:

Make sure the clock time is **not** 0 seconds.

(If the clock time is 0 seconds, click Play to run the simulation for at least 10 seconds. Then click Pause.)



Drag the time slider (▲) along the x-axis to 0 seconds.

What does the clock show when the time slider is at 0 seconds on the x-axis?

0 seconds

Problem 4: Explore the Graph Panel by dragging a dot along the y-axis

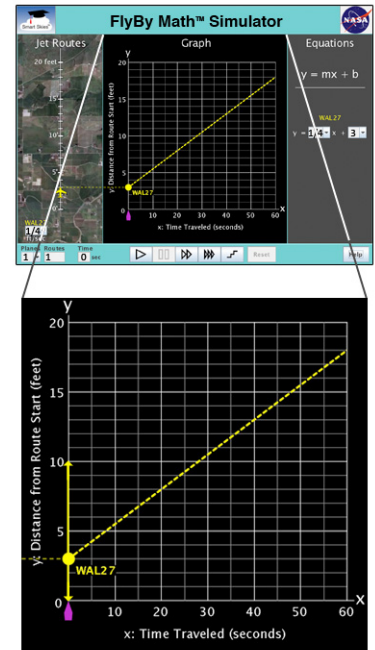
Set up the simulator:

- Time slider: 0 seconds
- WAL27 starting position: 3 ft
- Select: 1 plane, 1 route
- WAL27 starting speed: $\frac{1}{4}$ ft/sec

In the **Graph Panel**, drag the WAL27 dot up and down the y-axis. As you drag the dot, look at the **Jet Route Panel** and the **Equation Panel**.

Check the items that change when you drag the WAL27 dot:

- ☒ The position of the WAL27 plane on its jet route.
- ☐ The WAL27 plane speed.
- ☐ The value of m in the WAL27 equation.
- ☒ The value of b in the WAL27 equation.



Problem 5: Explore the Graph Panel by rotating a line

Set up the simulator:

- Time slider: 0 seconds
- WAL27 starting position: 3 ft
- Select: 1 plane, 1 route
- WAL27 starting speed: $\frac{1}{4}$ ft/sec

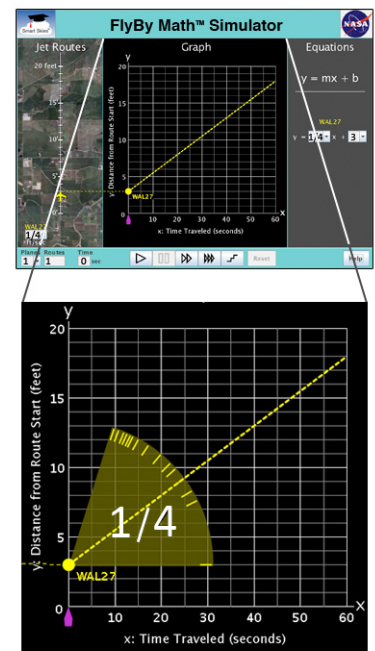
- (a) In the **Graph Panel**, click and hold the mouse on the WAL27 line so the slope of the line appears.

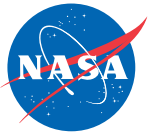
What is the slope of the WAL27 line? $\frac{1}{4}$ ft/sec

- (b) In the **Graph Panel**, drag and rotate the WAL27 line. As you rotate the line, also look at the **Jet Route Panel** and the **Equation Panel**.

Check the items that change when you rotate the WAL27 line:

- ☒ The slope of the WAL27 line.
- ☐ The position of the WAL27 plane on its jet route.
- ☒ The WAL27 plane speed.
- ☒ The value of m in the WAL27 equation.
- ☐ The value of b in the WAL27 equation.





Problem 6: Explore the Equation Panel by changing the value of m

Set up the simulator:

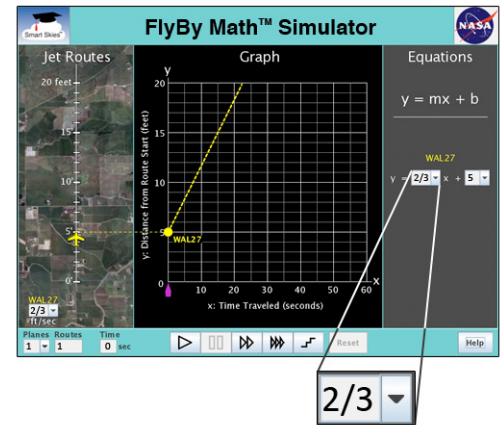
- Time slider: 0 seconds
- WAL27 starting position: 5 ft
- Select: 1 plane, 1 route
- WAL27 starting speed: $\frac{2}{3}$ ft/sec

In the **Equation Panel**, use a menu to choose some different values for m .

Each time you choose a new value for m , look at the **Jet Route Panel** and the **Graph Panel**.

Check the items that change when you change the value of m :

- ☐ The position of the WAL27 plane on its jet route.
- ☒ The WAL27 plane speed.
- ☐ The position of the WAL27 dot on the y-axis of the graph.
- ☒ The slope (steepness) of the WAL27 line.



Problem 7: Explore the Equation Panel by changing the value of b

Set up the simulator:

- Time slider: 0 seconds
- WAL27 starting position: 5 ft
- Select: 1 plane, 1 route
- WAL27 starting speed: $\frac{2}{3}$ ft/sec

In the **Equation Panel**, use a menu to choose some different values for b .

Each time you choose a new value for b , look at the **Jet Route Panel** and the **Graph Panel**.

Check the items that change when you change the value of b :

- ☒ The position of the WAL27 plane on its jet route.
- ☐ The WAL27 plane speed.
- ☒ The position of the WAL27 dot on the y-axis of the graph.
- ☐ The slope (steepness) of the WAL27 line.

